

WHAT IS CLAIMED IS:

1. An electromagnetic clutch comprising:

5 a magnetic flux loop forming member including an electromagnet, having a coil and a yoke, and an armature, and forming a magnetic flux loop upon excitation of the coil;

a clutch operative to be coupled or uncoupled by the armature that is operatively shifted in response to an electromagnetic force generating during excitation of the coil; and

10 a proximate member placed close proximate to the magnetic flux loop forming member, wherein

at least one of the magnetic flux loop forming member and the proximate member includes a magnetic flux leakage eliminating section eliminating an amount of magnetic fluxes leaked from the magnetic flux loop forming member to the proximate member during excitation of the coil.

2. The electromagnetic clutch according to claim 1, wherein

20 the magnetic flux leakage eliminating section includes of a spatial area defined between the magnetic flux loop forming member and the proximate member.

3. The electromagnetic clutch according to claim 2, wherein

25 the spatial area is formed along a direction of a magnetic flux loop formed in the magnetic flux loop forming member.

4. The electromagnetic clutch according to claim 1, wherein

30 the proximate member is made from material having a lower magnetic permeability than that of the magnetic flux loop forming member.

5. The electromagnetic clutch according to claim 1, wherein the proximate member includes a shaft member, and a support member coaxially disposed with the shaft member and having a supporting relationship therewith; and

the magnetic flux loop forming member is coaxially disposed with the shaft member and has a supporting relationship with the support member.

6. The electromagnetic clutch according to claim 5, wherein the magnetic flux leakage eliminating section includes a first spatial area defined among the magnetic flux loop forming member, the shaft member and the support member.

7. The electromagnetic clutch according to claim 5, wherein the magnetic flux leakage eliminating section includes a second spatial area defined between the magnetic flux loop forming member and the shaft member.

8. The electromagnetic clutch according to claim 5, wherein the magnetic flux leakage eliminating section includes a third spatial area defined between the shaft member and the support member.

9. The electromagnetic clutch according to claim 5, wherein the proximate member is coaxially disposed with the shaft member and further includes a rotary member that has a supporting relationship with the magnetic flux loop forming member at an outside area in a radial direction of the shaft member; and

the magnetic flux leakage eliminating section includes a fourth spatial area defined between the magnetic flux loop forming member and the rotary member.

5 10. The electromagnetic clutch according to claim 2, further comprising:

a frictional type main clutch disposed between input and output torque transfer members; and

10 a cam mechanism converting a torque, inputted through the clutch, into a pressure force; wherein

the clutch includes a pilot clutch whereby when the pilot clutch is coupled, the pressure force of the cam mechanism generating when applied with the torque urges the main clutch that is consequently coupled.

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11. The electromagnetic clutch according to claim 1, wherein the magnetic flux loop forming member is coaxially disposed with the proximate member and having a supporting relationship therewith; and

20 the proximate member is made from material with a lower magnetic permeability than that of the magnetic flux loop forming member.

12. The electromagnetic clutch according to claim 11, wherein

25 the magnetic flux leakage eliminating section includes a spatial area defined between the magnetic flux loop forming member and the proximate member.

13. The electromagnetic clutch according to claim 11, wherein

30 the proximate member is disposed close proximate to an end

of the magnetic flux loop forming member at an area axially opposite to the armature with respect to the electromagnet.

14. The electromagnetic clutch according to claim 1, wherein

5 the proximate member includes an opposing member operative to allow the armature to be freely shifted through a connecting section located between the armature and the opposing member; and

10 the magnetic flux leakage eliminating section is disposed on the connecting section between the armature and the opposing member.

15. The electromagnetic clutch according to claim 14, wherein

15 the connecting section includes a splined section having mutually meshing spline teeth formed on the opposing member and the armature, respectively; and

20 the magnetic flux leakage eliminating section includes spatial areas defined between tooth-cut-out portions, formed adjacent to the spline teeth of at least one of the opposing member and the armature, and the spline teeth of the other one of the opposing member and the armature.

16. The electromagnetic clutch according to claim 14, wherein

25 the connecting section includes a splined section having mutually meshing spline teeth formed on the opposing member and the armature, respectively; and

30 the magnetic flux leakage eliminating section includes spatial areas defined between tooth-height adjusted teeth, formed adjacent to the spline teeth of at least one of the opposing member and the armature, and the spline teeth of the

other one of the opposing member and the armature.

17. The electromagnetic clutch according to claim 14, further comprising:

5 a frictional type main clutch disposed between input and output torque transfer members; and

 a cam mechanism converting a torque, inputted through the clutch, into a pressure force; wherein

10 the clutch includes a pilot clutch whereby when the pilot clutch is coupled, the pressure force of the cam mechanism generating when applied with the torque urges the main clutch that is consequently coupled.

18. An electromagnetic clutch device comprising:

15 a magnetic flux loop forming member including an electromagnet, having a coil and a yoke, a rotor, an armature and a friction plate whose rotation is limited through shifting operation of the armature and operative to allow magnetic fluxes to pass to form a magnetic flux loop upon excitation of the coil; and

20 a plurality of proximate members placed close proximate to a circumferential circumference of the magnetic flux loop forming member; wherein

25 a spaced portion is formed in a part of opposing surfaces between the magnetic flux loop forming member and the proximate member with a view to decreasing a magnetic permeability of magnetic fluxes passing from the magnetic flux loop forming member to the proximate member for permitting the magnetic fluxes to be directed in a direction of the magnetic flux loop.

30 19. The electromagnetic clutch according to claim 18, wherein

the spaced portion is formed of a plurality of air gaps defined between the magnetic flux loop forming member and the proximate member.

5 20. The electromagnetic clutch according to claim 19, wherein
the spaced portion is formed of a plurality of air gaps defined between at least one of components of the magnetic flux loop forming member and the proximate member.

10 21. The electromagnetic clutch according to claim 19, wherein
the proximate member is made from material with a lower magnetic permeability than that of the magnetic flux loop forming member.

15 22. The electromagnetic clutch according to claim 19, wherein
the plurality of air gaps are disposed in at least one of an axial direction and a radial direction of the rotor.

20 23. The electromagnetic clutch according to claim 19, wherein
the plurality of air gaps are disposed at spaced intervals in an axial direction.

25 24. The electromagnetic clutch according to claim 18, wherein
the spaced portion has a shape to keep a given mating strength between the magnetic flux loop forming member and the proximate member.